WHAT IS CLAIMED IS:

1   1.   A method of communicating information regarding a failure

2   comprising:

3   generating failure information, wherein

4   said failure affects a virtual path,

5   said virtual path is between a first node and a second node,

6   a first zone comprises said first node, and

7   a second zone comprises said second node.

1   2.   The method of claim 1, wherein said failure information comprises:

2   a zone identifier.

1   3.   The method of claim 2, further comprising:

2   determining said zone identifier by identifying a zone in which said failure has

3   occurred.

1   4.   The method of claim 1, wherein said failure information comprises:

2   an action code.

1   5.   The method of claim 4, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   6.   The method of claim 5, wherein

2   said idle action indicates no action need be performed, and

3   said restored action indicates said virtual path has been successfully restored.

1   7.   The method of claim 5, wherein said first restore path action indicates

2   said virtual path should be restored using intra-zone resources.

1   8.   The method of claim 5, wherein said second restore path action

2   indicates said virtual path should be restored using inter-zone resources.

1   9.   The method of claim 1, further comprising:

2   sending said failure information.

1   10.   The method of claim 9, further comprising:

2   communicating said failure information in an in-band channel.

1   11.   The method of claim 10, further comprising:

2   inserting said failure information in a frame, wherein

3   said failure information comprises a zone identifier and an action code.

1   12.   The method of claim 11, wherein said zone identifier identifies a zone

2   in which said failure has occurred.

1   13.   The method of claim 11, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   14.   The method of claim 13, wherein said first restore path action indicates

2   said virtual path should be restored using intra-zone resources.

1   15.   The method of claim 13, wherein said second restore path action

2   indicates said virtual path should be restored using inter-zone resources.

1   16.   The method of claim 11, wherein said frame is a SONET frame and

2   said inserting said failure information comprises:

3   inserting said zone identifier in a K1 byte of said SONET frame, and

4   inserting said action code in a K2 byte of said SONET frame.

1   17.   The method of claim 16, wherein said inserting is performed at a third

2   node and said communicating further comprises:

3   communicating said failure information from said third node to a fourth node,

4   wherein said SONET frame includes one of an AIS and an RDI.

1   18.   The method of claim 17, wherein said fourth node is a border node.

1   19.   The method of claim 17, wherein said border node acts as a proxy node

2   for one of said first and said second nodes, and the method further comprises:

3   initiating restoration of said virtual path, said restoration being initiated by

4   said proxy node.

1   20.   A computer system comprising:

2   a processor;

3   computer readable medium coupled to said processor; and

4   computer code, for communicating information regarding a failure and

5   encoded in said computer readable medium, configured to cause said

6   processor to:

7   generate failure information, wherein

8   said failure affects a virtual path,

9   said virtual path is between a first node and a second node,

10   a first zone comprises said first node, and

11   a second zone comprises said second node.

1   21.   The computer system of claim D20, wherein said failure information

2   comprises:

3   a zone identifier.

1   22.   The computer system of claim 21, wherein said computer code is

2   further configured to cause said processor to:

3   determine said zone identifier by identifying a zone in which said failure has

4   occurred.

1   23.   The computer system of claim 20, wherein said failure information

2   comprises:

3   an action code.

1   24.   The computer system of claim D23, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   25.   The computer system of claim 24, wherein

2   said idle action indicates no action need be performed, and

3   said restored action indicates said virtual path has been successfully restored.

1   26.   The computer system of claim 24, wherein said first restore path action

2 indicates said virtual path should be restored using intra-zone resources.

1   27.   The computer system of claim 24, wherein said second restore path

2 action indicates said virtual path should be restored using inter-zone resources.

1   28.   The computer system of claim 20, wherein said computer code is

2 further configured to cause said processor to:

3   send said failure information.

1   29.   The computer system of claim 28, wherein said computer code

2 configured to cause said processor to send said failure information is further

3 configured to cause said processor to:

4   communicate said failure information in an in-band channel.

1   30.   The computer system of claim 29, wherein said computer code is

2 further configured to cause said processor to:

3   insert said failure information in a frame, wherein

4   said failure information comprises a zone identifier and an action code.

1   31.   The computer system of claim 29, wherein said zone identifier

2 identifies a zone in which said failure has occurred.

1   32.   The computer system of claim 30, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   33.   The computer system of claim 32, wherein said first restore path action

2   indicates said virtual path should be restored using intra-zone resources.

1   34.   The computer system of claim 32, wherein said second restore path

2   action indicates said virtual path should be restored using inter-zone resources.

1   35.   The computer system of claim 30, wherein said frame is a SONET

2   frame, and said computer code configured to cause said processor to insert said failure

3   information is further configured to cause said processor to:

4   insert said zone identifier in a K1 byte of said SONET frame, and

5   insert said action code in a K2 byte of said SONET frame.

1   36.   The computer system of claim 35, wherein said inserting is performed

2   at a third node, and said computer code configured to cause said processor to

3   communicate is further configured to cause said processor to:

4   communicate said failure information from said third node to a fourth node,

5   wherein said SONET frame includes one of an AIS and an RDI.

1   37.   The computer system of claim 36, wherein said fourth node is a border

2   node.

1   38.   The computer system of claim 36, wherein said border node acts as a

2   proxy node for one of said first and said second nodes, and said computer code is

3   further configured to cause said processor to:

4   initiate restoration of said virtual path, said restoration being initiated by said

5   proxy node.

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1   39.   A computer program product encoded in computer readable media,
2   said computer program product comprising:
3   a first set of instructions, executable on a computer system, configured to
4   generate failure information, wherein
5   said failure affects a virtual path,
6   said virtual path is between a first node and a second node,
7   a first zone comprises said first node, and
8   a second zone comprises said second node.

1   40.   The computer program product of claim 39, wherein said failure
2   information comprises:
3   a zone identifier.

1   41.   The computer program product of claim 40, further comprising:
2   a second set of instructions, executable on said computer system, configured
3   to determine said zone identifier by identifying a zone in which said
4   failure has occurred.

1   42.   The computer program product of claim 39, wherein said failure
2   information comprises:
3   an action code.

1   43.   The computer program product of claim 42, wherein said action code
2   is one of:
3   an idle action,
4   a restored action,
5   a first restore path action, and
6   a second restore path action.

1   44.   The computer program product of claim 43, wherein
2   said idle action indicates no action need be performed, and
3   said restored action indicates said virtual path has been successfully restored.

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1   45.   The computer program product of claim 43, wherein said first restore
2   path action indicates said virtual path should be restored using intra-zone resources.

1   46.   The computer program product of claim 43, wherein said second
2   restore path action indicates said virtual path should be restored using inter-zone
3   resources.

1   47.   The computer program product of claim 39, further comprising:
2   a second set of instructions, executable on said computer system, configured
3   to send said failure information.

1   48.   The computer program product of claim 47, wherein said second set of
2   instructions further comprises:
3   a first sub-set of said second set of instructions, executable on said computer
4   system, configured to communicate said failure information in an in-
5   band channel.

1   49.   The computer program product of claim 48, further comprising:
2   a third set of instructions, executable on said computer system, configured to
3   insert said failure information in a frame, wherein
4   said failure information comprises a zone identifier and an action code.

1   50.   The computer program product of claim 49, wherein said zone
2   identifier identifies a zone in which said failure has occurred.

1   51.   The computer program product of claim 49, wherein said action code
2   is one of:
3   an idle action,
4   a restored action,
5   a first restore path action, and
6   a second restore path action.

1   52.   The computer program product of claim 51, wherein said first restore

2 path action indicates said virtual path should be restored using intra-zone resources.

1   53.   The computer program product of claim 51, wherein said second

2 restore path action indicates said virtual path should be restored using inter-zone

3 resources.

1   54.   The computer program product of claim 49, wherein said frame is a

2 SONET frame, and said third set of instructions further comprises:

3   a first sub-set of instructions, executable on said computer system, configured

4   to insert said zone identifier in a K1 byte of said SONET frame; and

5   a second sub-set of instructions, executable on said computer system,

6   configured to insert said action code in a K2 byte of said SONET

7   frame.

1   55.   The computer program product of claim 54, wherein said third set of

2 instructions is performed at a third node, and said first sub-set of said second set of

3 instructions further comprises:

4   a first sub-sub-set of instructions, executable on said computer system,

5   configured to communicate said failure information from said third

6   node to a fourth node, wherein said SONET frame includes one of an

7   AIS and an RDI.

1   56.   The computer program product of claim 55, wherein said fourth node

2 is a border node.

1   57.   The computer program product of claim 55, wherein said border node

2 acts as a proxy node for one of said first and said second nodes, and further

3 comprising:

4   a second set of instructions, executable on said computer system, configured

5   to initiate restoration of said virtual path, said restoration being

6   initiated by said proxy node.

1   58.   An apparatus for communicating information regarding a failure

2   comprising:

3   means for generating failure information, wherein

4   said failure affects a virtual path,

5   said virtual path is between a first node and a second node,

6   a first zone comprises said first node, and

7   a second zone comprises said second node.

1   59.   The apparatus of claim 58, wherein said failure information comprises:

2   a zone identifier.

1   60.   The apparatus of claim 59, further comprising:

2   means for determining said zone identifier by identifying a zone in which said

3   failure has occurred.

1   61.   The apparatus of claim 58, wherein said failure information comprises:

2   an action code.

1   62.   The apparatus of claim 61, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   63.   The apparatus of claim 62, wherein

2   said idle action indicates no action need be performed, and

3   said restored action indicates said virtual path has been successfully restored.

1   64.   The apparatus of claim 62, wherein said first restore path action

2   indicates said virtual path should be restored using intra-zone resources.

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1   65.   The apparatus of claim 62, wherein said second restore path action
2   indicates said virtual path should be restored using inter-zone resources.

1   66.   The apparatus of claim 58, further comprising:
2   means for sending said failure information.

1   67.   The apparatus of claim 66, further comprising:
2   means for communicating said failure information in an in-band channel.

1   68.   The apparatus of claim 67, further comprising:
2   means for inserting said failure information in a frame, wherein
3   said failure information comprises a zone identifier and an action code.

1   69.   The apparatus of claim 68, wherein said zone identifier identifies a
2   zone in which said failure has occurred.

1   70.   The apparatus of claim 68, wherein said action code is one of:
2   an idle action,
3   a restored action,
4   a first restore path action, and
5   a second restore path action.

1   71.   The apparatus of claim 70, wherein said first restore path action
2   indicates said virtual path should be restored using intra-zone resources.

1   72.   The apparatus of claim 70, wherein said second restore path action
2   indicates said virtual path should be restored using inter-zone resources.

1   73.   The apparatus of claim 68, wherein said frame is a SONET frame and
2   said means for inserting said failure information comprises:
3   means for inserting said zone identifier in a K1 byte of said SONET frame,
4   and
5   means for inserting said action code in a K2 byte of said SONET frame.

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1   74.   The apparatus of claim 73, wherein a third node comprises said means

2   for inserting and said means for communicating further comprises:

3   means for communicating said failure information from said third node to a

4   fourth node, wherein said SONET frame includes one of an AIS and an

5   RDI.

1   75.   The apparatus of claim 74, wherein said fourth node is a border node.

1   76.   The apparatus of claim 74, wherein said border node acts as a proxy

2   node for one of said first and said second nodes, and further comprising:

3   means for initiating restoration of said virtual path, said restoration being

4   initiated by said proxy node.

1   77.   A method of communicating information regarding a failure

2   comprising:

3   receiving failure information at a node, wherein

4   said failure affects a virtual path,

5   said virtual path is between a first node and a second node,

6   a first zone comprises said first node, and

7   a second zone comprises said second node.

1   78.   The method of claim 77, wherein said failure information comprises:

2   a zone identifier; and

3   an action code.

1   79.   The method of claim 78, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1 80. The method of claim 79, wherein

2 said idle action indicates no action need be performed, and

3 said restored action indicates said virtual path has been successfully restored.

1 81. The method of claim 79, wherein said first restore path action indicates

2 said virtual path should be restored using intra-zone resources.

1 82. The method of claim 79, wherein said second restore path action

2 indicates said virtual path should be restored using inter-zone resources.

1 83. The method of claim 77, further comprising:

2 determining if said node is a proxy node.

1 84. The method of claim 83, wherein said failure information comprises:

2 an action code.

1 85. The method of claim 84, further comprising:

2 if said node is a proxy node,

3 determining if said proxy node can initiate a restoration process.

1 86. The method of claim 85, further comprising:

2 if said proxy node cannot initiate a restoration process,

3 setting said action code to RESTORE_X.

1 87. The method of claim 86, further comprising:

2 communicating said failure information to another node.

1 88. The method of claim 85, further comprising:

2 if said proxy node can initiate a restoration process,

3 determining if said restoration process has already been initiated by

4 said proxy node.

89.	The method of claim 88, further comprising:

if said restoration process has not already been initiated by said proxy node,

causing said proxy node to initiate said restoration process, and

setting said action code to IDLE.

90.	The method of claim 89, further comprising:

communicating said failure information to another node.

91.	The method of claim 88, further comprising:

if said restoration process has already been initiated by said proxy node,

determining if said restoration process has completed successfully.

92.	The method of claim 91, further comprising:

if said restoration process has completed successfully,

setting said action code to RESTORED.

93.	The method of claim 92, further comprising:

communicating said failure information to another node.

94.	The method of claim 91, further comprising:

if said restoration process has not completed successfully,

determining if said restoration process is proceeding successfully.

95.	The method of claim 94, further comprising:

if said restoration process is proceeding successfully,

setting said action code to IDLE.

96.	The method of claim 95, further comprising:

communicating said failure information to another node.

97.	The method of claim 94, further comprising:

if said restoration process is not proceeding successfully,

setting said action code to RESTORE_X.

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1   98.   The method of claim 97, further comprising:

2   communicating said failure information to another node.

1   99.   The method of claim 77, further comprising:

2   determining if said node is a source node, wherein said node being said source

3   node indicates that said node in one of said first and said second nodes.

1   100.   The method of claim 99, wherein said failure information comprises:

2   an action code.

1   101.   The method of claim 100, further comprising:

2   if said node is a source node,

3   determining if said action code is IDLE.

1   102.   The method of claim 101, further comprising:

2   if said action code is IDLE,

3   setting an entry in a virtual path lookup table corresponding to said

4   virtual path to RESTORING.

1   103.   The method of claim 101, further comprising:

2   if said action code is IDLE,

3   preventing said node from initiating a restoration process.

1   104.   The method of claim 100, further comprising:

2   if said node is a source node,

3   determining if said action code is RESTORED.

1   105.   The method of claim 104, further comprising:

2   if said action code is RESTORED,

3   setting an entry in a virtual path lookup table corresponding to said

4   virtual path to RESTORED.

1   106.   The method of claim 100, further comprising:

2   if said node is a source node,

3   determining if said action code is RESTORE_I.

1   107.   The method of claim 106, further comprising:

2   if said action code is RESTORE_I,

3   initiating an intra-zone restoration process.

1   108.   The method of claim 100, further comprising:

2   if said node is a source node,

3   determining if said action code is RESTORE_X.

1   109.   The method of claim 108, further comprising:

2   if said action code is RESTORE_X,

3   initiating an end-to-end restoration process.

1   110.   The method of claim 109, further comprising:

2   communicating said failure information.

1   111.   The method of claim 77, further comprising:

2   communicating said failure information.

1   112.   The method of claim 111, wherein said communicating comprises:

2   inserting said failure information into a frame.

1   113.   The method of claim 112, wherein said frame is a SONET frame and

2 said inserting said failure information comprises:

3   inserting said zone identifier in a K1 byte of said SONET frame, and

4   inserting said action code in a K2 byte of said SONET frame.

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1 114. The method of claim 113, wherein said inserting is performed at a third

2 node and the method further comprises:

3 communicating said failure information from said third node to a fourth node,

4 wherein said SONET frame includes one of an AIS and an RDI.

1 115. A computer system comprising:

2 a processor;

3 computer readable medium coupled to said processor; and

4 computer code, for communicating information regarding a failure and

5 encoded in said computer readable medium, configured to cause said

6 processor to:

7 receive failure information at a node, wherein

8 said failure affects a virtual path,

9 said virtual path is between a first node and a second node,

10 a first zone comprises said first node, and

11 a second zone comprises said second node.

1 116. The computer system of claim 115, wherein said failure information

2 comprises:

3 a zone identifier; and

4 an action code.

1 117. The computer system of claim 116, wherein said action code is one of:

2 an idle action,

3 a restored action,

4 a first restore path action, and

5 a second restore path action.

1 118. The computer system of claim 117, wherein

2 said idle action indicates no action need be performed, and

3 said restored action indicates said virtual path has been successfully restored.

1   119.   The computer system of claim 117, wherein said first restore path

2   action indicates said virtual path should be restored using intra-zone resources.

1   120.   The computer system of claim 117, wherein said second restore path

2   action indicates said virtual path should be restored using inter-zone resources.

1   121.   The computer system of claim 115, wherein said computer code is

2   further configured to cause said processor to:

3   determine if said node is a proxy node.

1   122.   The computer system of claim 121, wherein said failure information

2   comprises:

3   an action code.

1   123.   The computer system of claim 122, wherein said computer code is

2   further configured to cause said processor to:

3   determine if said proxy node can initiate a restoration process, if said node is a

4   proxy node.

1   124.   The computer system of claim 123, wherein said computer code is

2   further configured to cause said processor to:

3   set said action code to RESTORE_X, if said proxy node cannot initiate a

4   restoration process.

1   125.   The computer system of claim 124, wherein said computer code is

2   further configured to cause said processor to:

3   communicate said failure information to another node.

1   126.   The computer system of claim 123, wherein said computer code is

2   further configured to cause said processor to:

3   determine if said restoration process has already been initiated by said proxy

4   node, if said proxy node can initiate a restoration process.

1   127.   The computer system of claim 126, wherein said computer code is

2 further configured to cause said processor to:

3   if said restoration process has not already been initiated by said proxy node,

4   cause said proxy node to initiate said restoration process, and

5   set said action code to IDLE.

1   128.   The computer system of claim 127, wherein said computer code is

2 further configured to cause said processor to:

3   communicate said failure information to another node.

1   129.   The computer system of claim 126, wherein said computer code is

2 further configured to cause said processor to:

3   if said restoration process has already been initiated by said proxy node,

4   determine if said restoration process has completed successfully.

1   130.   The computer system of claim 129, wherein said computer code is

2 further configured to cause said processor to:

3   if said restoration process has completed successfully,

4   set said action code to RESTORED.

1   131.   The computer system of claim 130, wherein said computer code is

2 further configured to cause said processor to:

3   communicate said failure information to another node.

1   132.   The computer system of claim 129, wherein said computer code is

2 further configured to cause said processor to:

3   if said restoration process has not completed successfully,

4   determine if said restoration process is proceeding successfully.

1   133.   The computer system of claim 132, wherein said computer code is

2 further configured to cause said processor to:

3   if said restoration process is proceeding successfully,

4   set said action code to IDLE.

1   134.   The computer system of claim 133, wherein said computer code is

2   further configured to cause said processor to:

3   communicate said failure information to another node.

1   135.   The computer system of claim 132, wherein said computer code is

2   further configured to cause said processor to:

3   if said restoration process is not proceeding successfully,

4   set said action code to RESTORE_X.

1   136.   The computer system of claim 135, wherein said computer code is

2   further configured to cause said processor to:

3   communicate said failure information to another node.

1   137.   The computer system of claim 115, wherein said computer code is

2   further configured to cause said processor to:

3   determine if said node is a source node, wherein said node being said source

4   node indicates that said node in one of said first and said second nodes.

1   138.   The computer system of claim 137, wherein said failure information

2   comprises:

3   an action code.

1   139.   The computer system of claim 138, wherein said computer code is

2   further configured to cause said processor to:

3   if said node is a source node,

4   determine if said action code is IDLE.

1   140.   The computer system of claim 139, wherein said computer code is

2   further configured to cause said processor to:

3   if said action code is IDLE,

4   set an entry in a virtual path lookup table corresponding to said virtual

5   path to RESTORING.

1   141.   The computer system of claim 139, wherein said computer code is

2   further configured to cause said processor to:

3   if said action code is IDLE,

4   prevent said node from initiating a restoration process.

1   142.   The computer system of claim 138, wherein said computer code is

2   further configured to cause said processor to:

3   if said node is a source node,

4   determine if said action code is RESTORED.

1   143.   The computer system of claim 142, wherein said computer code is

2   further configured to cause said processor to:

3   if said action code is RESTORED,

4   set an entry in a virtual path lookup table corresponding to said virtual

5   path to RESTORED.

1   144.   The computer system of claim 138, wherein said computer code is

2   further configured to cause said processor to:

3   if said node is a source node,

4   determine if said action code is RESTORE_I.

1   145.   The computer system of claim 144, wherein said computer code is

2   further configured to cause said processor to:

3   if said action code is RESTORE_I,

4   initiate an intra-zone restoration process.

1   146.   The computer system of claim 138, wherein said computer code is

2   further configured to cause said processor to:

3   if said node is a source node,

4   determine if said action code is RESTORE_X.

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1   147.   The computer system of claim 146, wherein said computer code is

2   further configured to cause said processor to:

3   if said action code is RESTORE_X,

4   initiate an end-to-end restoration process.

1   148.   The computer system of claim 147, wherein said computer code is

2   further configured to cause said processor to:

3   communicate said failure information.

1   149.   The computer system of claim 115, wherein said computer code is

2   further configured to cause said processor to:

3   communicate said failure information.

1   150.   The computer system of claim 149, wherein said computer code

2   configured to communicate said failure information is further configured to cause said

3   processor to:

4   insert said failure information into a frame.

1   151.   The computer system of claim 149, wherein said frame is a SONET

2   frame and said computer code configured to cause said processor to insert said failure

3   information is further configured to cause said processor to:

4   insert said zone identifier in a K1 byte of said SONET frame, and

5   insert said action code in a K2 byte of said SONET frame.

1   152.   The computer system of claim 151, wherein said computer code

2   configured to cause said processor to insert said failure information is executed at a

3   third node, and said computer code is further configured to cause said processor to:

4   communicate said failure information from said third node to a fourth node,

5   wherein said SONET frame includes one of an AIS and an RDI.

1   153.   A computer program product encoded in computer readable media,
2   said computer program product comprising:
3   a first set of instructions, executable on a computer system, configured to
4   receive failure information at a node, wherein
5   said failure affects a virtual path,
6   said virtual path is between a first node and a second node,
7   a first zone comprises said first node, and
8   a second zone comprises said second node.

1   154.   The computer program product of claim 153, wherein said failure
2   information comprises:
3   a zone identifier; and
4   an action code.

1   155.   The computer program product of claim 154, wherein said action code
2   is one of:
3   an idle action,
4   a restored action,
5   a first restore path action, and
6   a second restore path action.

1   156.   The computer program product of claim 155, wherein
2   said idle action indicates no action need be performed, and
3   said restored action indicates said virtual path has been successfully restored.

1   157.   The computer program product of claim 155, wherein said first restore
2   path action indicates said virtual path should be restored using intra-zone resources.

1   158.   The computer program product of claim 155, wherein said second
2   restore path action indicates said virtual path should be restored using inter-zone
3   resources.

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1 159. The computer program product of claim 153, further comprising:
2 a second set of instructions, executable on said computer system, configured
3 to determine if said node is a proxy node.

1 160. The computer program product of claim 159, wherein said failure
2 information comprises:
3 an action code.

1 161. The computer program product of claim 160, further comprising:
2 a third set of instructions, executable on said computer system, configured to
3 determine if said proxy node can initiate a restoration process, if said
4 node is a proxy node.

1 162. The computer program product of claim 161, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to
3 set said action code to RESTORE_X, if said proxy node cannot initiate
4 a restoration process.

1 163. The computer program product of claim 161, further comprising:
2 a fifth set of instructions, executable on said computer system, configured to
3 communicate said failure information to another node.

1 164. The computer program product of claim 161, further comprising:
2 a fourth set of instructions, executable on said computer system, configured to
3 determine if said restoration process has already been initiated by said
4 proxy node, if said proxy node can initiate a restoration process.

1 165. The computer program product of claim 164, further comprising:
2 a fifth set of instructions, executable on said computer system, configured to,
3 if said restoration process has not already been initiated by said proxy
4 node,
5 cause said proxy node to initiate said restoration process, and

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6   set said action code to IDLE.

1   166.   The computer program product of claim 165, further comprising:
2   a sixth set of instructions, executable on said computer system, configured to
3   communicate said failure information to another node.

1   167.   The computer program product of claim 164, further comprising:
2   a fifth set of instructions, executable on said computer system, configured to,
3   if said restoration process has already been initiated by said proxy
4   node,
5   determine if said restoration process has completed successfully.

1   168.   The computer program product of claim 167, further comprising:
2   a sixth set of instructions, executable on said computer system, configured to,
3   if said restoration process has completed successfully,
4   set said action code to RESTORED.

1   169.   The computer program product of claim 168, further comprising:
2   a seventh set of instructions, executable on said computer system, configured
3   to communicate said failure information to another node.

1   170.   The computer program product of claim 167, further comprising:
2   a sixth set of instructions, executable on said computer system, configured to,
3   if said restoration process has not completed successfully,
4   determine if said restoration process is proceeding successfully.

1   171.   The computer program product of claim 170, further comprising:
2   a seventh set of instructions, executable on said computer system, configured
3   to, if said restoration process is proceeding successfully,
4   set said action code to IDLE.

1   172.   The computer program product of claim 171, further comprising:

2   a eighth set of instructions, executable on said computer system, configured to

3   communicate said failure information to another node.

1   173.   The computer program product of claim 170, further comprising:

2   a seventh set of instructions, executable on said computer system, configured

3   to, if said restoration process is not proceeding successfully,

4   set said action code to RESTORE_X.

1   174.   The computer program product of claim 173, further comprising:

2   a ninth set of instructions, executable on said computer system, configured to

3   communicate said failure information to another node.

1   175.   The computer program product of claim 153, further comprising:

2   a second set of instructions, executable on said computer system, configured

3   to determine if said node is a source node, wherein said node being

4   said source node indicates that said node in one of said first and said

5   second nodes.

1   176.   The computer program product of claim 175, wherein said failure

2   information comprises:

3   an action code.

1   177.   The computer program product of claim 176, further comprising:

2   a third set of instructions, executable on said computer system, configured to,

3   if said node is a source,

4   determine if said action code is IDLE.

1   178.   The computer program product of claim 177, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to,

3   if said action code is IDLE,

4   set an entry in a virtual path lookup table corresponding to said virtual

5   path to RESTORING.

1   179.   The computer program product of claim 177, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to,

3   if said action code is IDLE,

4   prevent said node from initiating a restoration process.

1   180.   The computer program product of claim 176, further comprising:

2   a third set of instructions, executable on said computer system, configured to,

3   if said node is a source node,

4   determine if said action code is RESTORED.

1   181.   The computer program product of claim 180, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to,

3   if said action code is RESTORED,

4   set an entry in a virtual path lookup table corresponding to said virtual

5   path to RESTORED.

1   182.   The computer program product of claim 176, further comprising:

2   a third set of instructions, executable on said computer system, configured to,

3   if said node is a source node,

4   determine if said action code is RESTORE_I.

1   183.   The computer program product of claim 182, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to,

3   if said action code is RESTORE_I,

4   initiate an intra-zone restoration process.

1   184.   The computer program product of claim 176, further comprising:

2   a third set of instructions, executable on said computer system, configured to,

3   if said node is a source node,

4   determine if said action code is RESTORE_X.

1   185.   The computer program product of claim 184, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to,

3   if said action code is RESTORE_X,

4   initiate an end-to-end restoration process.

1   186.   The computer program product of claim 184, further comprising:

2   a fourth set of instructions, executable on said computer system, configured to

3   communicate said failure information.

1   187.   The computer program product of claim 153, further comprising:

2   a second set of instructions, executable on said computer system, configured

3   to communicate said failure information.

1   188.   The computer program product of claim 153, wherein said second set

2   of instructions comprises:

3   a first sub-set of instructions, executable on said computer system, configured

4   to insert said failure information into a frame.

1   189.   The computer program product of claim 188, wherein said frame is a

2   SONET frame, and said first sub-set of instructions comprises:

3   a first sub-sub-set of instructions, executable on said computer system,

4   configured to insert said zone identifier in a K1 byte of said SONET

5   frame; and

6   a second sub-sub-set of instructions, executable on said computer system,

7   configured to insert said action code in a K2 byte of said SONET

8   frame.

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1   190.   The computer program product of claim 189, wherein said first sub-set

2   of instructions are executed at a third node, and said computer program further

3   comprises:

4   a third set of instructions, executable on said computer system, configured to

5   communicate said failure information from said third node to a fourth

6   node, wherein said SONET frame includes one of an AIS and an RDI.

1   191.   An apparatus for communicating information regarding a failure

2   comprising:

3   means for receiving failure information at a node, wherein

4   said failure affects a virtual path,

5   said virtual path is between a first node and a second node,

6   a first zone comprises said first node, and

7   a second zone comprises said second node.

1   192.   The apparatus of claim 191, wherein said failure information

2   comprises:

3   a zone identifier; and

4   an action code.

1   193.   The apparatus of claim 192, wherein said action code is one of:

2   an idle action,

3   a restored action,

4   a first restore path action, and

5   a second restore path action.

1   194.   The apparatus of claim 193, wherein

2   said idle action indicates no action need be performed, and

3   said restored action indicates said virtual path has been successfully restored.

1   195.   The apparatus of claim 193, wherein said first restore path action

2   indicates said virtual path should be restored using intra-zone resources.

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1   196.   The apparatus of claim 193, wherein said second restore path action

2   indicates said virtual path should be restored using inter-zone resources.

1   197.   The apparatus of claim 191, further comprising:

2   means for determining if said node is a proxy node.

1   198.   The apparatus of claim 197, wherein said failure information

2   comprises:

3   an action code.

1   199.   The apparatus of claim 198, further comprising:

2   means for determining if said proxy node can initiate a restoration process, if

3   said node is a proxy node.

1   200.   The apparatus of claim 199, further comprising:

2   setting said action code to RESTORE_X, if said proxy node cannot initiate a

3   restoration process.

1   201.   The apparatus of claim 200, further comprising:

2   communicating said failure information to another node.

1   202.   The apparatus of claim 199, further comprising:

2   determining if said restoration process has already been initiated by said proxy

3   node, if said proxy node can initiate a restoration process.

1   203.   The apparatus of claim 202, further comprising:

2   causing said proxy node to initiate said restoration process, if said restoration

3   process has not already been initiated by said proxy node, and

4   setting said action code to IDLE, also if said restoration process has not

5   already been initiated by said proxy node.

1   204.   The apparatus of claim 203, further comprising:

2   communicating said failure information to another node.

1   205.   The apparatus of claim 202, further comprising:

2   determining if said restoration process has completed successfully, if said

3   restoration process has already been initiated by said proxy node.

1   206.   The apparatus of claim 205, further comprising:

2   setting said action code to RESTORED, if said restoration process has

3   completed successfully.

1   207.   The apparatus of claim 206, further comprising:

2   communicating said failure information to another node.

1   208.   The apparatus of claim 205, further comprising:

2   determining if said restoration process is proceeding successfully, if said

3   restoration process has not completed successfully.

1   209.   The apparatus of claim 208, further comprising:

2   setting said action code to IDLE, if said restoration process is proceeding

3   successfully.

1   210.   The apparatus of claim 209, further comprising:

2   communicating said failure information to another node.

1   211.   The apparatus of claim 208, further comprising:

2   setting said action code to RESTORE_X, if said restoration process is not

3   proceeding successfully.

1   212.   The apparatus of claim 211, further comprising:

2   communicating said failure information to another node.

1   213.   The apparatus of claim 191, further comprising:

2   determining if said node is a source node, wherein said node being said source

3   node indicates that said node in one of said first and said second nodes.

1   214.   The apparatus of claim 213, wherein said failure information

2 comprises:

3   an action code.

1   215.   The apparatus of claim 214, further comprising:

2   determining if said action code is IDLE, if said node is a source node.

1   216.   The apparatus of claim 215, further comprising:

2   setting an entry in a virtual path lookup table corresponding to said virtual

3   path to RESTORING, if said action code is IDLE.

1   217.   The apparatus of claim 215, further comprising:

2   preventing said node from initiating a restoration process, if said action code is

3   IDLE.

1   218.   The apparatus of claim 214, further comprising:

2   determining if said action code is RESTORED, if said node is a source node.

1   219.   The apparatus of claim 218, further comprising:

2   setting an entry in a virtual path lookup table corresponding to said virtual

3   path to RESTORED, if said action code is RESTORED.

1   220.   The apparatus of claim 214, further comprising:

2   determining if said action code is RESTORE_I, if said node is a source node.

1   221.   The apparatus of claim 220, further comprising:

2   initiating an intra-zone restoration process, if said action code is RESTORE_I.

1   222.   The apparatus of claim 214, further comprising:

2   determining if said action code is RESTORE_X, if said node is a source node.

1　　　223.　The apparatus of claim 222, further comprising:

2　　initiating an end-to-end restoration process, if said action code is

3　　　　RESTORE_X.

1　　　224.　The apparatus of claim 223, further comprising:

2　　communicating said failure information.

1　　　225.　The apparatus of claim 191, further comprising:

2　　communicating said failure information.

1　　　226.　The apparatus of claim 225, wherein said communicating comprises:

2　　inserting said failure information into a frame.

1　　　227.　The apparatus of claim 226, wherein said frame is a SONET frame and

2　said inserting said failure information comprises:

3　　　inserting said zone identifier in a K1 byte of said SONET frame, and

4　　　inserting said action code in a K2 byte of said SONET frame.

1　　　228.　The apparatus of claim 227, wherein said inserting is performed at a

2　third node and the method further comprises:

3　　　communicating said failure information from said third node to a fourth node,

4　　　　wherein said SONET frame includes one of an DIS and an RDI.